AMENDMENTS TO THE CLAIMS

1. **(Original)** An analytic chemistry system, comprising a population of beads including separate subpopulations, each subpopulation carrying chemical functionality which changes an optical signature of the beads in the presence of targeted analytes, beads in each subpopulation having an optical signature which is encoded with a description of the chemical functionality carried by that subpopulation.

2. **(Original)** The system described in Claim 1, wherein the beads are encoded using dyes.

3. **(Original)** The system described in Claim 2, wherein the dyes are entrapped within the beads and the chemical functionality is on surfaces of the beads.

4. **(Original)** The system described in Claim 1, wherein the beads are encoded using fluorescent dyes.

5. **(Original)** The system described in Claim 1, wherein the beads are encoded by controlling a ratio of at least two dyes.

6. **(Original)** The system described in Claim 1, wherein the chemical functionality changes the optical signature by producing an optically active chemical in the presence of targeted analytes.

7. **(Original)** The system described in Claim 1, wherein the optical signature is changed by the chemical functionalities of the beads by the presence or absence of a fluorescent signal.

8. **(Original)** The system described in Claim 1, wherein the chemical functionalities of the beads support sites for hybridization.

9. **(Withdrawn)**

10. **(Withdrawn)**

11. **(Original)** A chemical analysis method, comprising

preparing separate subpopulations of beads, each subpopulation carrying chemical functionalities that change optical signatures of the beads in the presence of targeted analytes;

encoding optical signature of the beads in each subpopulation with a description of the chemical functionalities carried by that subpopulation;

combining the subpopulations to produce a system;

applying the system;

detecting changes in the optical signatures indicative of a presence of the targeted analytes; and

decoding optical signature of the beads to identify the chemical functionalities.

12. **(Original)** The method described in Claim 11, wherein encoding the optical signatures with the chemical functionalities comprises doping the beads with fluorescent dyes.

13. **(Original)** The method described in Claim 11, wherein encoding the optical signatures with chemical functionalities comprises attaching encoding dyes to the beads.

14. **(Original)** The method described in Claim 11, wherein encoding the optical signatures with the chemical functionalities comprises controlling a ratio of at least two dyes carried by each bead.

15. **(Original)** The method described in Claim 11, further comprising:

encoding the beads with the chemical functionalities by entrapping dyes within or attaching dyes to the beads; and

applying the chemical functionalities to the beads.

16. **(Original)** The method in Claim 11, further comprising enabling the chemical functionalities to produce an optically active species in the presence of targeted analytes to change the optical signature.

17. **(Original)** The method described in Claim 11, further comprising changing the optical signature by the presence or absence of a fluorescent signal from the beads.

18. **(Original)** The method described in Claim 11, further comprising enabling the chemical functionalities to hybridize.

Claims 19-31 **(Withdrawn)**

32. **(New)** An analytic chemistry system comprising a population of beads including separate subpopulations, the beads of each subpopulation carrying:

i) a first chemical functionality capable of changing a first optical signature of the bead in the presence of a target analyte, wherein the beads of each subpopulation further comprise a second optical signature which is encoded with a description of said first chemical functionality carried by said subpopulation.

33. **(New)** The system described in Claim 32, wherein the beads are encoded using dyes.

34. **(New)** The system described in Claim 32, wherein the dyes are entrapped within the beads and the chemical functionality is on surfaces of the beads.

35. **(New)** The system described in Claim 32, wherein the beads are encoded using fluorescent dyes.

36. **(New)** The system described in Claim 32, wherein the beads are encoded by controlling a ratio of at least two dyes.

37. **(New)** The system described in Claim 32, wherein the first chemical functionality is selected from the group consisting of nucleic acids and proteins.

38. **(New)** The system described in Claim 37, wherein the first chemical functionality comprises nucleic acids.

39. **(New)** The system described in Claim 37, wherein the first chemical functionality comprises protein.

40. **(New)** A chemical analysis method comprising:

a) contacting a population of beads with a composition comprising at least a first target analyte, wherein said population of beads comprises a first and a second subpopulation, the beads of each subpopulation comprising:

i) a chemical functionality capable of changing a first optical signature of the bead in the presence of a target analyte; and

ii) a second optical signature which is encoded with a description of said chemical functionality carried by the bead of the subpopulation;

b) detecting a change in the first optical signature beads of at least one of said first or second subpopulation of beads;

c) decoding said second optical signature of said beads to identify the first chemical functionality.

41 **(New)** The method according to claim 40, wherein said second optical signature comprises fluorescent dyes.

42. **(New)** The method according to claim 41, wherein said beads are doped with said fluorescent dyes.

43. **(New)** The method according to claim 41, wherein said fluorescent dyes are attached to said beads.

44. **(New)** The method according to claim 40, wherein said second optical signature comprises at least two dyes carried on each bead.

45. **(New)** The method according to claim 40, wherein said first chemical functionality is selected from the group consisting of nucleic acids and proteins.

46. **(New)** The method according to claim 45, wherein said chemical functionality is a nucleic acid.

47. **(New)** The method according to claim 45, wherein said chemical functionality is a protein.